

The application of Research Based Learning Model in electric power system protection course

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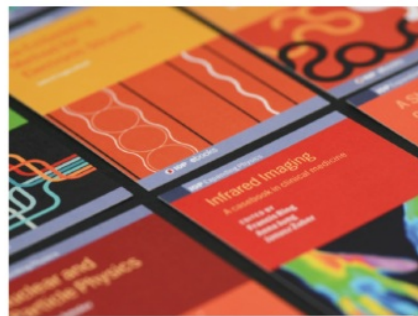
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The application of Research Based Learning Model in electric power system protection course

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Abstract. The learning model should be adapted to the learning needs of today and the future. The achievement of student learning in each competency courses one of which depends the learning model used. Among the models of learning that develop current that brings the students can develop their ability in mastering the learning material is Research Based Learning (RBL) model. This model focuses on the students as learning resources that integrate research in learning. This research aims to assess the effectiveness of student learning on courses of electric power system protection after used RBL model. This study applies the nine-step RBL model in courses of electric power system protection consisting of identifying research topic, objectives and research question, research tools both data collection tools and intervention tools, applying theory, research methodology and design, data analysis, results and discussion, recommendation, and strengthen of the research. After using the RBL model in learning then an increase in measurable student learning outcomes in the assessment of the effectiveness of formative and summative evaluation.

1. Introduction

Model learning now this already developed enough in giving solutions to problems that become an obstacle in the process of learning. In the context of learning, the model is a way to simplify it felt became complicated more simple can be physical or conceptual presentation of the system of learning, as well as attempting to explain the interconnectedness of the various components the learning system into a pattern or framework of thought is presented as a whole. The learning model is a reference to an approach including objectives, learning the syntax, the environment, and systems management [9]. A good learning model is used as a reference in planning learning in class or tutorial to determine learning devices that comply with the materials being taught [11].

The new model is currently being developed is a Model Research Based Learning (RBL). This model is a model of the advances in technology-based education theory of konstruktivisme that offers the atmosphere of a democratic learning, student-based, carried out by the process of field observations (inquiry), oriented to obtain a perfect understanding of the theory and technology, authentic tasks, scientific research is conducted collaboratively [5].

Some research also develops models using the RBL in learning such as research lays out an increase in the competence of students with a learning model RBL [1][3][10][15], RBL model development bases inquiry-based learning (IBL) have also proven to be suitable in learning on computer courses engineering students [6], blending model of collaborative learning and RBL (CRBL) by making a step model for learners and facilitators successfully developed [12].

See the development of this model and its application which can improve student learning outcomes, then this model can be said to deserve to be used as a teaching reference in the learning process [13]. This model is not limited in its application was implemented only in the classroom but can also be implemented outside of the class [14], if judging from the characteristics of the models are integrated with research, the application of this model also proved a match held on courses and research activities such as a final assignment [6].



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The proper course for applications this model, one of them is the electrical power protection system courses. Why so, because on this subject, there is still a variety of constraints that occur in its commissioning, so that optimal achievement yet affect competence. Limitations of infrastructure such as laboratories, laboratory equipment is quite expensive protection makes the procurement of equipment constrained [8] but the demands of the industry towards graduates who have practical experience tend to increase [4], in addition to a lack of learning media in the process of teaching and learning has also become an obstacle in learning this subject [2] [7], the model is used for teaching in the learning process is still limited. Process study on electrical power protection system courses is still limited to the method of lecture with little practical experience [8].

In answering the question on subjects related electric power system protection system courses lack of laboratory facilities and infrastructure solutions provided by designing educational laboratory development tailored to the needs of the industry [4]. This aims to give students practice experience with industrial protective equipment and software through the course-based classes. The second obstacle faced in electric power system protection courses in the form of lack of learning media, then Brian K and Robert E developed a method of computer simulations in facilitating learning using the power system protection EMTP software [2]. while Ren J and Kezunovic M do modeling and simulation in applying protection relay on Smart Grid [7]. Looking for a solution to the limitations of model learning efforts improved student learning experience through a computer-based simulations and practical experiments [8].

Viewed from constraint, then the model RBL is expected to answer deficiencies in the organization of courses the electrical power protection system, namely in the form of lack of laboratory infrastructure so that students do not get/less practical experience and limited learning model applied. In this study researchers using RBL model developed by Sota and Karl P as a proven model can improve the learning results of students through the steps model that brings the research in learning. This model consists of nine steps that are carried out in the study.

2. Methodology

This research was carried out at the Concentrations of Energy Electrical Engineering UIN Suska Riau in learning electrical power protection system courses with brings the RBL model has been developed by Sota and Karl P [10]. This study applies the nine-step consisting of identifying research topic, objectives and research question, research tools both data collection tools and intervention tools, applying theory, research methodology and design, data analysis, results and discussion, recommendation, and strengthen of the research. Implementation step RBL model presented in the classroom of learning. Researchers can fully describe as follows

Table 1. Application RBL Model in Course

Week	Objectives	Activities
1	Introduction	Distribution of course syllabus
1	Students are expected to learn the material related lectures and prepare a presentation topic appropriate tasks each group	Assigning students study all the topics. Each group prepares the material to match the topics will be presented.
1	Students seeking research journal	Assigning students seeking research journal
1	Students prepare a presentation in the form of PPT to the assigned topics and presented it in accordance with the steps model RBL	Assign students to learn and focus on their research and present it. Each group discuss their duties on the subject matter and research by searching for the source of the journal.
2-7-9-14	Students prepare material suitable topic lectures were commissioned and present it, further discussed	Each group prepared a material suitable topic lectures and present in the form of PPT in class
8	Midterm Examination	
2-7-9-14	Students searching for journals related research topics.	Each group looking for a research journal. Each group of students is asked to read, analyze, and prepare PPT to presented in class.
14	Questions And Answers	Distribute questions
15	Final Examination	

3. Result and Analysis

The application of step RBL model in courses of electric power system protection has been made, the methods used in assessing the effectiveness of student learning outcomes are implemented in the form of formative and summative evaluation.

3.1 Formative Evaluation

A formative evaluation is the assessment of student learning in courses of electric power protection system using the RBL model implemented in every step of the study. Researchers see the development of learning in the classroom by making assessment of the activities carried out in each step of the learning model. The following student activities assessment report results in each step of the model that has been implemented.

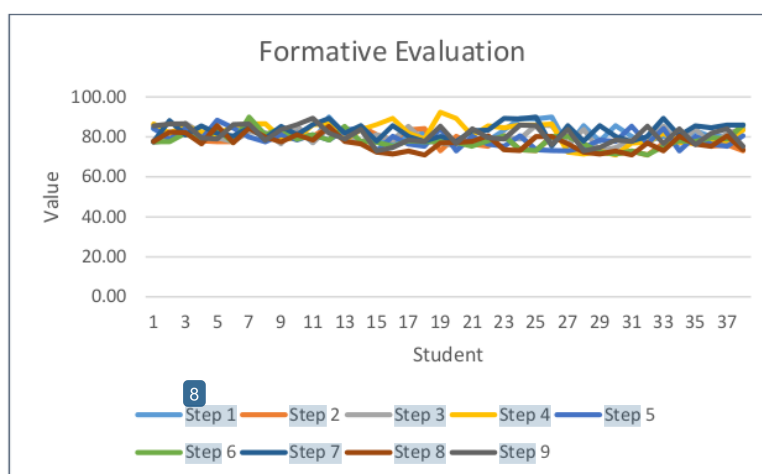


Figure 1. Formative Evaluation in courses of electric power protection system using the RBL model. The results obtained in the evaluation of students for each step has a formative value above 70, which has a category well until very fine.

3.2. Summative Evaluation

A summative evaluation was conducted to test the effectiveness of the course of electric power protection system by providing multiple choice question which have tested the validity and reliability. The purpose of this evaluation is to test students comprehension level against materials on these subjects. The problem given to measure cognitive ability students before learning courses electric power protection system (pretest) and at the moment after the applied model RBL (posttest). The following test results of evaluation summative.

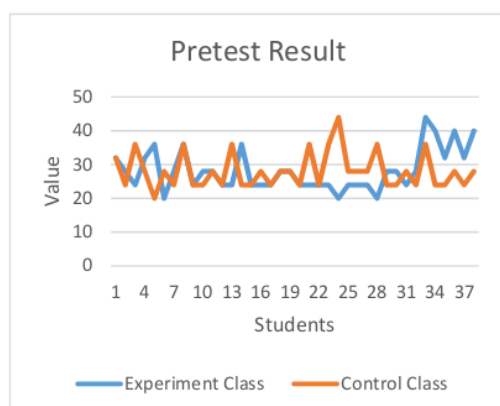


Figure 2. Pretest Result of Experiment and Control Class

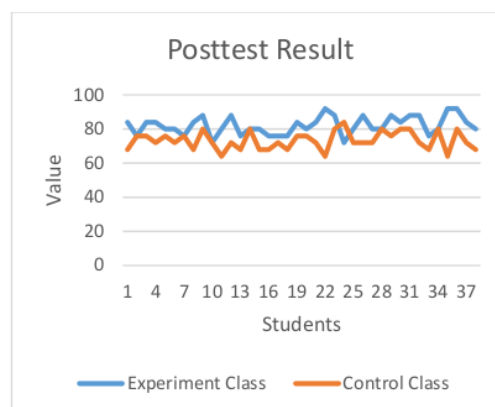


Figure 3. Posttest Result of Experiment and Control Class

After the assessment of the test questions are implemented, the results obtained by the students after answering tests given analyzed again with its homogeneity test, normality test, and independet sample T test (effectiveness test).

Tabel 2. Result of Homogenity, Normality and T Test to measure effectiveness with SPSS

Test	Signification
Homogeneity test	0,851
Normality test	pretest = 0,07 posttest= 0,06
Independen sample T test	0,911

4. Analysis

Based on the output of its homogeneity test with spss results above, obtained a value of Significance (Sig) Based on the Mean of $0.05 > 0.851$, so it can be inferred that the posttest of control and experiment class are the same or homogeneous. Normality test results obtained the value of control class variant significance $p = 0.07$ $p > \alpha$ and experimental values for the variant class significance $p = 0.06$ so $p > \alpha$. Thus the samples come from a normal population. Based on the output of the test T retrieved the value of the sig (2-tailed) of 0.05 $0.00 >$, then the appropriate basis of decision making in a test of the independent samples T-test, then it can be inferred H_0 denied H_a accepted which means that there is a difference against average the results of students posttest control and experiments class. Test results on the effectiveness of the research States that occur a significant difference results between eksperimen and control class the results of the experiment class showed the learning outcomes are improved when compared control class. So it can be stated that learning with model RBL developed has managed to increase the effectiveness of learning of students in the subjects of electric power system protection.

5. Conclusion

After carrying out the study with a Research Based Learning Model courses in electric power protection system, research results prove that this model has succeeded in enhancing the effectiveness of student learning through formative and summative evaluation of the results of statistical tests exposing (test of its homogeneity, test of normality, and T-test) in this research. The test results stated that RBL model has managed to improve the learning outcomes of students significantly.

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